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**To:** Examiner Meredith C. Petravick    **Date:** September 28, 2006  
**Fax #:** (571) 273-8300    **Pages:** 38, including this cover sheet.  
**From:** Stephen D. Timmons  
**Subject:** Inventor: O'Halloran, Michael L. et al.  
Serial No. 10/765,029  
Filed: 1/26/2004  
Title: Wide Cut Harvester Having Rotary Cutter Bed  
Group Art 3671  
Docket No. 22299-REI

**Message:**

I hereby certify that the Amendment to July 5, 2006 Office Action (6 pgs.); Second Statement of Status and Support for Changes to Claims Under 37 CFR § 1.173(c) (4 pgs); Supplemental Declaration for Reissue Patent Application by the Assignee (3 pgs) with Miscellaneous Attachments (24 pgs) is being facsimile transmitted to the United States Patent and Trademark Office (571) 273-8300 on September 28, 2006.

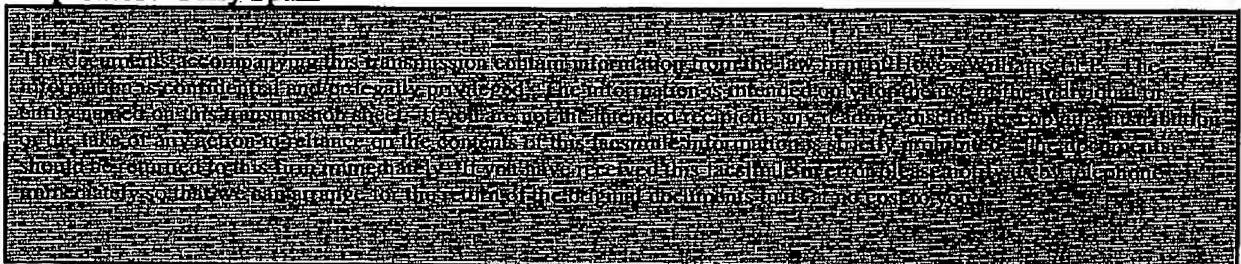
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# ADE & COMPANY INC.

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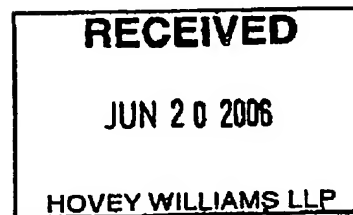
May 15, 2006

Hovey Williams LLP  
2405 Grand Blvd. - Suite 400  
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U.S.A.

Attention: Mr. Stephen D. Timmons

Dear Sir:

RE: AGCO Canadian Re-Examination  
Canadian Patent No: 2,188,870  
Canadian Patent No: 2,189,029  
Canadian Patent No: 2,300,818



We refer to the proposals for amendment filed recently on the above patents by your Associates in Canada Gowling Lafleur Henderson and particularly Konrad A. Sechley of that firm.

We attach copies of papers filed on behalf of MacDon which include comments which point out a number of potential weaknesses in those proposals. You will see that the papers terminate with the conclusion that the proposals for amendment should be rejected leaving the patents invalid.

You will note that the potential weaknesses identified in respect of the Canadian patents also will reflect on the corresponding US patents. You may therefore wish to ensure that the US Examiner is advised of these comments so as to ensure that allegations cannot be not raised at a later time that you have withheld these comments in order that the US Examiner may proceed in ignorance of these comments. You will also note that the papers include a translation of the reference of Maier which is EP 0 016 661 which was not

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previously submitted. You may also wish to send this translation to the US Examiner since it is our understanding that no translation of this reference is on file.

If you have any questions, please let us know.

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Enc.(1)

cc Gowling Lafleur Henderson LLP – Mr. Konrad A. Sechley  
cc MacDon Industries Ltd. – Mr. Gary A. MacDonald  
c.c. Fillmore Riley LLP - Mr. Neil Johansson

PATENT NO. 2,189,029  
ISSUED: February 29<sup>th</sup> 2000  
FILED: May 20<sup>th</sup> 1994  
PRIORITY: April 28<sup>th</sup> 1994  
FOR: WIDE CUT HARVESTER HAVING ROTARY  
CUTTER BED  
OWNER: HAY & FORAGE INDUSTRIES

Canadian Intellectual Property Office  
Place du Portage 1, 3rd Floor  
50 Victoria Street  
Hull, Quebec  
K1A 0C9

COPY

Dear Sir:

Attached hereto is a copy of a translation of the description of European Patent Specification 0116661 which was previously submitted in this matter with only the claims translated.

REMARKS OF REQUESTER ON RE-EXAMINATION OF A PATENT UNDER  
SECTION 48.1(1) OF THE PATENT ACT

The following remarks are presented by the requestor for re-examination on the above patent and it is requested that these remarks be considered prior to issuance of a decision in the above re-examination process.

General Remarks on Amendments in Claims

It is submitted that each amendment to a claim and the claim as a whole must be subjected to tests on the basis of the following requirements:

1. It is required that claims in a patent be clear and unambiguous. This is clearly set forth in section 27(4) of the Patent Act and in Rule 84.

No speculation should be necessary to determine what is covered by each claim.

The claim must set out the limits of what is protected. If the claim fails to do this, whether by error or deliberately, the claim must be invalid. The public is entitled to be able to determine by analysis rather than by opinion or guess-work what is the scope and limits of the claim.

Wording should not be so flexible that several interpretations of it are possible, that is, the claim should not have more than one meaning or be capable of both broad and narrow interpretations

From Procter & Gamble Inc. and The Procter & Gamble Company v. Unilever PLC, and Lever Brothers Limited (1995), 61 C.P.R. (3d) 499 (F.C.A. per Stone J.A.):

"In *Natural Colour Kinematograph Co. Ltd. v. Bioschemes Ltd.* (1915). 32 R.P.C. 256 (H.L.), Lord Loreburn, in a well-spoken passage, forcefully condemned ambiguity in a patent claim. In the course of doing so he stated, at page 266:

*"It is the duty of the patentee to state clearly and distinctly, either in direct words or by clear and direct reference, the nature and limits of what he claims. If he uses language which, when fairly read, is avoidably obscure or ambiguous, the Patent is invalid, whether the defect be due to design, or to*

*carelessness or to want of skill. Where the invention is difficult to explain, due allowance will, of course, be made for any resulting difficulty in the language. But nothing can excuse the use of ambiguous language when simple language can easily be employed, and the only safe way is for the patentee to do his best to be clear and intelligible. It is necessary to emphasize this warning."*

Thus the Patentee must, in pain of invalidity of his patent, avoid language which is obscure and must define the limits of his invention.

2. The claims must be supported by the description. This is clearly specified in Rule 84 wherein it is stated that "the claim shall be clear and concise and shall be fully supported by the description independently of any document referred to in the description".

Thus all characteristics of the embodiment of the invention which are set forth in the claim must be fully set forth in the description.

This rule clearly specifies that the claim must be supported by the description and not merely by an element which may (or may not) be illustrated in the drawings.

It must be noted that the present matter is dealing with a granted patent. There is no possibility for amendment of the description part of a patent in a re-examination process since the re-examination board has no statutory authority for such changes. (See Manual at Paragraph 23.02.07)

Amendments may be made in the specification of a patent application under Section 38.2(1) and (2) to include in the description subject matter which may be reasonably inferred from the patent application as a whole

including the description, claims and drawings. However Section 38.2(1) states that this can only occur "before the patent is issued". Thus there is no possibility for the description to be amended after grant in a re-examination process to include matter which may (or may not) be shown in the drawings.

Thus the above Rule 84 applies to the claims that the claims must be "fully supported by the description independent of any document referred to therein". Thus there is no possibility for the claims to be amended to include limitations which are shown in the drawings but NOT fully supported by the description.

3. The claims must of course be valid relative to the prior art under consideration.

#### Claim 65 Limitation 1

The patentee has added into Claim 1 a number of additional limitations set out hereinafter, each of which must be considered in respect of the above three requirements.

They have added the following feature:

*"a pair of transversely extending oppositely rotating conditioning rolls disposed within and spanning said discharge opening above and behind the cutter bed for conditioning crop material received from the cutters," (emphasis added)*

#### Not supported by the description

Patentee stated that this is supported by the description on page 12 lines 27 to 29. However this merely states

*"as shown in Figure 2 the conditioning rolls 66 are located immediately behind the opening 102 which is in turn positioned directly behind the cutters 32C-32H."*

Also, not mentioned by patentee, on page 11 at line 2 there is disclosed that there is a pair of conditioning rolls 66.

There is no disclosure that the conditioning rolls are oppositely rotating. There is no disclosure that the conditioning rolls span the discharge opening. This whole amendment therefore has no basis in the description so that it is not fully supported by the description and the amendment must therefore be rejected.

Ambiguity of the claim under Section 27.4 and Rule 84

The arrangement and location of the conditioning rolls is not made clear as to whether these are parallel or in some other arrangement or orientation or whether they form a nip or whether they are arranged in some other position with no nip. This paragraph therefore is unclear and ambiguous. No correction of this ambiguity is possible in view of the lack of support in the description.

Invalidity in view of the Prior art of Mortl, Niemeyer, Vissers or Maier

This feature is of course well known on mowing machines. As one example only from a myriad of such examples, Vissers discloses in Figure 6 that such conditioner rollers can simply be added to an embodiment, shown in Figures 1 to 5 which have no such rollers. Conditioning rollers can thus be used or not used as required by the user.



Further, it is well established in the art and fully known to any person in the art that mowing machines, which collect crop into a swath, may have no conditioner or may include a conditioner as required by the user. If the conditioner is used there are a number of different types which can be used depending upon crop conditions and operating requirements. Basically there are three types of crop conditioning systems. One system uses resilient crushing roles pressed together with a high force. One system uses meshing rolls with longitudinal flutes so that the crop is cracked as it passes between the flutes. Another system uses rotating flail rolls which rotate about a horizontal axis and carry flails which impact upon the crop. All of these could be considered to be transversely extending conditioning rolls and all of these could include two such rolls.

This feature is therefore entirely common in the art and the person skilled in the art would select a conditioner system to be used or not used without any possible invention in this field.

Maier (as set forth in the translation attached) states in the fourth page second column at around line 40 that conditioning is sometimes required and sometimes not. Merely adding a conditioner therefore cannot be a patentable concept. Maier also discloses in the illustrated embodiment a conditioner of the type described above which uses a flail roller but also mentions on the third page first column at around line 14 that different types of construction of conditioner can be used.

This feature is therefore entirely common in the art and the person skilled in the art would select a conditioner system to be used or not used without any possible invention in this field.

**Claim 65 Limitation 2**

Patentee has added in relation to the intermediate cutters that they are "aligned with" the discharge opening. Thus the feature now states that the intermediate cutters are "*positioned in front of and aligned with the discharge opening*".

**Not supported by the description**

There is no support for the feature that the cutters are aligned with the opening and patentee has not alleged that any support can be found.

**Ambiguity of the claim under Section 27.4 and Rule 84**

The addition of this extra feature of alignment, in addition to the previously defined feature that the cutters are "in front of" the discharge opening, leads to ambiguity in that it is not clear what additional feature beyond the fact that they are positioned in front of the opening has been added.

**Invalidity in view of the Prior art of Mortl, Niemeyer or Maier**

Mortl and Maier show multiple pairs of cutters in front of the discharge opening. In view of the fact that the feature added by the additional limitation cannot be understood it is not clear whether the prior art includes this feature.

**Claim 65 Limitation 3**

Patentee has added the following limitation.

*"a pair of upright generally cylindrical impellers outboard of each of said opposite ends of the discharge opening".*

Not supported by the description

Patentee has pointed to the passage commencing on page 25 on line 37 and ending page 27, line 10 and also refers to Figures 11 to 18. As set forth hereinbefore, reference to the figures is improper since the claim must be fully supported by the description. In this passage there is a brief description of the construction shown in Figures 13, 14 and 15. This merely states that the elements concerned comprise the impeller cages 100 and 46.

Besides the use of the term "cage" there is no further description concerning the construction of these elements.

Further investigation of other passages in the description relating to the construction of any of these elements shows only a passage at page 10 commencing at line 13 wherein there is mentioned the impeller cage 46 but no description of its construction. At page 12 commencing at line 16 is a short passage describing the construction of the cage 100 in that it includes a "*kidney shaped impeller plate 98 and that it encircles the universal coupling 96*".

There is simply no support therefore for the use of the term "generally cylindrical impeller" in the description. It is submitted therefore that this term and the amendment containing it must be rejected since there is no support in the description.

Ambiguity of the claim under Section 27.4 and Rule 84

The expression "generally cylindrical" is unclear and ambiguous since it is well established that terms such as "generally" or "approximately" are not acceptable. Thus it is not clear for example whether the term requires a circular cross section of the cylinder. It is not clear whether the term requires that the impeller is of constant cross section as in a "cylinder" or whether a tapered element falls within this definition. In this regard, reference is made to the prior art of Mortl where the element 10 is used as an impeller. From Figures 4 and 5 it is clear that the element 10 has a non-circular cross section (triangular) and that the shape of the element is that it is tapered to form the frustum of a cone.

It is clear therefore that this feature in the claim is an essential element and must therefore be defined in a manner which is clear and unambiguous so that it clearly defines the limits of the invention which distinguish it from the prior art and clearly sets a scope of claimed protection for consideration and analysis by the public. The term "generally cylindrical", may be an attempt to include within the scope elements which are not directly or exactly cylindrical but include a slight taper. Thus, in the context where the prior art shows slightly conical elements, this term fails to define what are the limits of any such taper. The term "generally cylindrical", may be an attempt to include within the scope elements which are not directly or exactly circular in cross section. Thus, in the context where the prior art shows slightly non-circular elements, this term fails to define what are the limits of any such difference from a circle.

Invalidity in view of the Prior art of Mortl, Niemeyer or Maier

Mortl shows a pair of impellers which are located at the cutters. Maier shows a pair of impellers which are located at the cutters and are cylindrical.

**Claim 65 Limitation 4**

The patentees have added

*"each pair of said impellers being disposed higher than the cutters and rotatable in the same direction as one another such that front extremities thereof move inwardly toward the discharge opening"*

**Not supported by the description**

Patentee has pointed to the passage commencing on page 25 on line 37 and ending page 27 line 10 and also refers to Figures 11 to 18. As set forth hereinbefore, reference to the figures is improper since the claim must be fully supported by the description. There is simply no support therefore for the use of the term "higher than the cutters" in the description. It is submitted therefore that this term and the amendment containing it must be rejected since there is no support in the description.

**Invalidity in view of the Prior art of Mortl, Niemeyer or Maier**

Mortl shows a pair of impellers which are located and rotatable as defined, as indicated by the arrows. Maier shows a pair of impellers which are located and rotatable as defined.

**Claim 66**

**Invalidity in view of the Prior art of Mortl, Niemeyer or Maier**

Mortl and Maier show impellers located as defined. The shafts which drive the impellers are not shown but are merely an essential element to drive a cutter and impeller of this type.

**Claim 67**

Patentees have added the limitation

*"said outer impeller being rotatable on the same axis as the end cutter and said inner impeller being rotatable on the same axis as the next adjacent intermediate group cutter"*

**Not supported by the description**

The description is completely silent about the axes of rotation of the cages so that there is no basis for this limitation in the description.

**Invalidity in view of the Prior art**

Impellers having the same axis of rotation as the associated cutter are shown in many of the prior art documents including Mortl and Maier and Niemayer. This feature is merely trivial and cannot add anything patentable to the combination

**Claim 68**

Patentees have added the limitation

*"said front extremities of said outer, inner and intermediate impellers being generally in transverse alignment with one another and generally parallel with a front edge of the cutter bed"*

**Not supported by the description**

As set forth above in respect of Claim 8, the description at page 26, line 14 states that the front periphery of the drum 298 is in line with the front peripheries of the cages 100 and 46. The term "generally in transverse alignment with one another" is not present and has no basis in the description. If the term means the same thing as that actually present in the description then the same term should be used. If it means something different, then it has no basis and the new claim limitation should be rejected. Yet further there is no mention in the description that the line above is parallel to the front edge of the cutter bed.

Ambiguity of the claim under Section 27.4 and Rule 84

It is well established that terms such as "generally", "approximately", "about" are unacceptable terms since they do not provide the necessary specificity of definition.

Invalidity in view of the Prior art

This feature is merely a minor adjustment of the arrangement shown in Niemeyer

Claim 69

Patentees have added the limitation

*"said impellers comprising a cage having a series of upright members arranged in a circumferentially spaced pattern."*

Not supported by the description

As set forth above, the description of the intermediate impeller is that it is a "cage" in the embodiment shown in Figures 16, 17 and 18. The words

*"having a series of upright members arranged in a circumferentially spaced pattern"* simply do not appear in the description so that there is no support in the description for this amendment. It is submitted therefore that this amendment must be rejected.

Ambiguity of the claim under Section 27.4 and Rule 84

The term *"having a series of upright members arranged in a circumferentially spaced pattern"* is unclear and ambiguous.

Invalidity in view of the Prior art

Cages are shown in Neuerberg.

Claim 70

Patentees have added the limitation

*"said means for driving the end cutters including gears within said case"*

Not supported by the description

Applicants have provided no indication as to where this feature can be found in the description.

Column 1, line 55-63 states that *"it would be of considerable benefit if additional cutters could be added to the cutter bed without the need for adding additional gearing to the existing gear case."* (emphasis added). This states the exact opposite of the feature now added to the claim.

Column 2, lines 23-30 which again clearly state:

*"without designing a whole new gear case, complete with additional gearing"* (emphasis added)



Cutters 32a and 32j of the disclosure are driven, as shown for example in Figure 3, by belts 83 and 134 which form part of the "over-the-top mechanism" referred to at column 7, line 23. This "over-the-top mechanism" is used in place of gears within the gear case, as explained in the above quotation. The disclosure includes more than one such over-the-top drive mechanism. One illustration uses belts, one uses a large flat gear drive, and one uses 90 degree gear drives and shafts.

The specification clearly states at column 5, lines 50 to 52 that the extensions 40 supporting the end cutters "*contains no spur gears or other power distribution mechanism.*"

The addition by the Patentee of this feature in Claim 11 cannot therefore be understood.

Invalidity in view of the Prior art

The prior art provides gear cases such as in Mortl German 170 which are driven by components (not shown) within the gear case below the disks. It is conventional to use such gears within the gear case to drive the disks and thus this feature is either disclosed in German 170 or is obvious in view of German 170. The feature is also shown in EP 661 where the disks are driven from gear case 18.

General Comments on Obviousness of Claim 65

As set forth hereinbefore, the use of conditioners on mowing machines is of course well known. It is well established in the art and fully known to any person in the art that mowing machines which collect crop into a swath

may have no conditioner or may include a conditioner as required by the user.

This feature is therefore entirely common in the art and the person skilled in the art would select a conditioner system to be used or not used without any possible invention in this field.

The Patentee argues that it is more difficult to collect crop and to drive it through the machine when a conditioner is used. Their basis for this argument is the disclosure in a patent (2,300,818) which is dated many years subsequent to the present patent. The relevance of this subsequent patent to the matter in hand cannot be understood.

Even if their contention is correct that it is more difficult to drive crop through a pair of conditioning rollers, it is still merely obvious to attempt to add pair the conditioning rollers to the constructions of Mortl or Niemeyer or Maier because this is well known in the prior art. If it is determined that a problem exists of how to carry the crop material through the conditioner, as the Patentee contends, this will be determined after the combination is made. In such a case the problem will need to be solved. However the claimed invention provides no combination of elements which solve the alleged problem. The claimed features merely provide in combination the prior art construction of cutters and impellers together with the prior art conditioner rollers. Nothing has been added to solve the alleged problem. If there is indeed a problem, then the claim must be invalid for failure to provide features which solve the problem.

The Patentee's argument is thus faced with the dilemma that, either there is a problem to be solved and the claim must therefore be invalid for failing

to include features which solve the problem, or there is no problem and the combination is merely an obvious combination.

All of the elements concerned including the cage impellers on the outer cutters and the cage impeller or the drum impeller as an intermediate impeller, all of which rotate inwardly, are well known from the prior art of Mortl, Maier, Niemeyer, Vissers as cited herein.

Reference is made particularly to Maier which is not applied by the Re-examination Board which shows the use of impellers of the type concerned in conjunction with a conditioner. A translation of this document is now supplied for the assistance of the Board.

Also Vissers shows in Figure 6 the use of a conditioner system using two rollers where the rollers span a discharge opening. The use of conditioners in machines of this type is well known and merely an obvious choice. Vissers in Figures 1 to 3 has no conditioner so that it is clear that the person skilled in the art can choose to use or not to use a conditioner as required for the crop conditions. Vissers indicates no problem to add the conditioner since the construction used is substantially identical in both embodiments. Thus at column 3 line 54 Vissers simply states that the crop can be thrown (across the worm rotor 63) *"on the field (Fig.1) or into a crushing device 47 (Fig.6)"*. No problem is mentioned nor considered in changing from one arrangement to the other.

#### **CONCLUSION**

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It is submitted therefore that the amended claims presented by the patentee should be rejected on the grounds that they are unsupported by the description under Rule 84, that the claims are unclear and introduce ambiguity as is unacceptable under Section 27(4) and rule 84, and that the claims do not properly distinguish from the prior art submitted herein which is the subject of this re-examination.

Respectfully submitted

MACDON INDUSTRIES LTD.

PER:

Adrian D. Battison

ADB/II

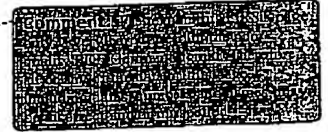
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Jouve, 18, rue St. Denis, 75001 Paris, France

0 116 661

**Description**

The invention relates to a mower, including a mower cutter bar, which extends substantially over the entire mower width, having the characteristics specified in the preamble of applicable patent specification 1.

A mower is known from DE-OS 28 39 841, which features a mower cutter bar, which extends substantially over the entire mower width, with a plurality of rotatably drivable mower discs being disposed on the upper surface of said mower cutter bar. The outer mower discs in each case are provided with drums, which transport the harvested crop to the middle and to the rear. The centers of the two outer drums are interconnected at their upper ends via a mower frame. This mower therefore has the disadvantage that the driving means required to drive the mower must be disposed at least partially to the side of the mower. Since it is not permitted to exceed an admissible transport width, a restriction on the mower width is unavoidable. Moreover, if the arrangement is maintained for more than three mower discs, the mower frame increases the weight of the mower, which is undesirable in terms of adapting to soil conditions.

The task that forms the basis of the present invention is to create a mower with a large working width, which, in particular, is distinguished by high stability in a lightweight design. A further supplement to the task is to design the mower in such a way that the necessary driving means can be accommodated within the mower width.

The invention solves the specified task by means of the measures stipulated in the characterizing portion of patent specification 1. The mower according to the invention features high stability with relatively low weight combined with a large working width, which can extend to the maximum admissible transport width.

Subclaim 2 addresses a preferred structural embodiment of the mower.

The measures proposed in subclaim 4 enable the formation of a free space above the inner drum that faces the tractor in which driving elements to drive the mower can be accommodated in such a way that they lie within the mower width.

Further, advantageous features are to be drawn from subclaims 5 to 8.

Further features essential to the invention and the resulting benefits are to be drawn from the following description with the aid of an example embodiment.

The drawing comprises the following figures:

Figure 1 shows a schematic top view of a drawn agricultural machine with a mower and a conditioning apparatus;

Figure 2 shows a schematic rear view of the agricultural machine according to Figure 1;

Figure 3 comprises a partially sectioned top view showing details of the agricultural machine according to Figure 1;

Figure 4 shows a rear view of the arrangement according to Figure 3 without the conditioning apparatus;

Figure 5 shows a lateral view of the agricultural machine according to Figure 3;

Figure 6 shows a section along the line VI-VI in Figure 1;

Figure 7 shows the agricultural machine with mower and conditioning apparatus in its retracted transport position;

Figure 8 shows the agricultural machine according to Figure 7 with means to lock the conditioning apparatus in the retracted transport position; and,

Figure 9 shows the agricultural machine with the mower in its working position and the attached, though inoperative, conditioning apparatus.

Figures 1-5 show the basic design of an agricultural machine with a mower and a conditioning apparatus.

The agricultural machine shown in schematic top view in Figure 1 disposes of main frame 1, which, viewed in relation to the direction of travel, is preceded by mower 2 in a manner that will be described in more detail below and followed by conditioning apparatus 3 in a manner that will also be described in more detail below.

Subframe 4 extends in parallel to main frame 1. Subframe 4 is pivotably mounted on bearings 5 and 6 of main frame 1. Extension arms 7 and 8 are attached to subframe 4 in proximity to bearings 5 and 6. The free, downward-pointing ends of extension arms 7 and 8 carry wheels 9 and 10, by means of which the agricultural machine supports itself on the soil surface.

In a similar manner to subframe 4, mower frame 11 of mower 2, which has relative movement to main frame 1, is coupled to this latter element.

Additional bearing 12 is provided on the end of main frame 1 shown on the left of the drawing. This additional bearing accommodates partially depicted towing device 13 in a lockable and pivotable mounting. Towing device 13 is connected with a tractor or similar device that is not shown in the drawing. Towing device 13 can be rotated out of the position shown, which corresponds to the working position, in which the agricultural machine works to the side of the tractor, into a position shown in the drawing as a broken line. This end position represents the transport position in which the agricultural machine extends substantially coaxial to the tractor.

Additionally, gear system 14 is flange mounted on the end of main frame 1 shown on the left of the drawing. Gear system 14 is in driving connection with the undepicted motor drive of the tractor via drive shaft 15, which is formed as a universal joint

shaft. The driving of mower 2 and conditioning apparatus 3 originates from gear system 14.

In the embodiment shown in the drawing, conditioning apparatus 3 consists of rotor shaft 16, which is equipped with a plurality of substantially V-shaped 'fingers', so-called tines 17. Rotating tines 17 seize the harvested crop, which has been cut by mower 2 and deposited in swathes on the soil surface, in the process of which it is conveyed "overhead" while simultaneously being processed (conditioned) and then redeposited on the soil surface. The design and function of such a conditioning apparatus are already well known. Instead of the rotor shaft equipped with the proposed tines, it is also possible to use a different type of construction (e.g., a brush rotor).

The mower design is depicted with particular clarity in Figure 1 and Figure 4. Mower 2 comprises a design combining elements of a drum mower and a disc mower. Mower 2 supports itself in its working position on the soil surface by means of mower cutter bar 18, which extends substantially over the entire mower width. Mower cutter bar 18 disposes of bearings and driving elements for multiple (six in the embodiment pictured here) mower discs 19. Mower discs 19 rotate in a coplanar configuration immediately above mower cutter bar 18. They are oval-shaped and equipped with cutting knives 20. Drums 21 are mounted on the respective outside mower discs to enable improved conveyance of the harvested product towards the center.

It is also possible to equip the respective next mower discs 19 from the outside with drums 21, depending on requirements. It should be noted that this involves an essential design feature of the specified mower 2. As is particularly visible in Figure 4, three of the provided mower discs 19 are equipped with drums 21. Viewed from left to right in relation to the drawing, this involves the first two mower discs 19 and the right-hand, outer mower disc 19.

While mower cutter bar 18 extends across the entire mower width, mower frame 11 (as viewed in the drawing according to Figure 4) merely links up left-hand, second drum 21 with outer, right-hand drum 21. In other words, this means that mower frame 11 is kept shorter than mower cutter bar 18 by an amount substantially corresponding to the working width of first mower disc 19. This serves to create a free space indicated by arrow 22 above first drum 21, into which gear system 14, which is flange-mounted on main frame 1, can protrude. In order to further increase the size of free space 22, the overall height of left-hand, first drum 21 in Figure 4 is kept lower (upper edge 24) than remaining drums 21. This means, however, that the available working width can be fully equivalent to the maximum admissible transport width, since all the structural components of the agricultural machine are accommodated within the mower width. For the rest, mower frame 11, together with second drum

21, right-hand, outside drum 21, and mower cutter bar 18, form a self-contained, stable, approximately rectangular frame. Despite its lightweight, compact design with a low overall height, mower 2 is characterized by a large working width, a low degree of required constructional effort, and high stability.

The driving elements for mower 2 and conditioning apparatus 3 are formed as follows:

Figure 5, in particular, shows how gear system 14 is flange-mounted on main frame 1, as mentioned above. The connection can be made using additional bearing bracket 23. Gear system 14 (cf. Figure 3) disposes of input bevel gear drive 25, via the intermediary of which drive shaft 15 (cf. Figure 1) is in driving connection with first spur gear 26. Bevel gear drive 25 features input shaft 25', which runs in parallel with universal joint shaft 15 in order to prevent non-uniformity. Spur gear 26 is mounted on intermediate shaft 25" and is linked with further spur gear 27 through a meshing connection. Spur gear 27 is mounted in a torsionally rigid manner on input shaft extension 28. Two spur gears 30 and 31 are mounted on further input shaft extension 29 in a non-displaceable manner. Spur gear 31 is in constant driving connection with spur gear 27.

Spur gear 30 is in driving connection with additional spur gear 33 via the intermediary of chain/rope/belt drive 32 (chain belt or toothed belt). Once again, this spur gear 33 is mounted in a torsionally rigid manner on an input shaft extension 34. A first longitudinally-changeable universal joint shaft 35 links input shaft extension 28 with input shaft 36' of mower 2.

One end of a second universal joint shaft 36, which is also longitudinally-changeable, is in driving connection either with input shaft extension 29 or input shaft extension 34, as desired. At its other end, universal joint shaft 36 is linked to countershaft 37, which, together with chain/rope/belt drive 38 (chain belt drive or toothed belt drive), is used to drive rotor shaft 16 of the conditioning apparatus. The option is available of switching the connection of universal joint shaft 36, which means that rotor shaft 16 can be driven at different speeds. If universal joint shaft 36 is connected for this purpose with input shaft extension 34, then rotor shaft 16 rotates at its highest speed. If universal joint shaft 36 is connected to input shaft extension 29, then rotor shaft 16 is driven at a lower speed. In this manner, the possibility is provided of influencing the conditioning effect of rotor shaft 16 and tines 17, respectively.

As indicated above, the driving of mower discs 19 of mower 2 originates from input shaft 36'. Viewed in relation to Figure 4 from left to right, second mower disc 19 is driven by a vertical shaft, for which no further details are provided. The remaining mower discs 19 are driven from below, i.e., by driving means, which are provided in mower cutter bar 18.

The following sections refer to Figures 6 and 7 in order to provide information that is more detailed on the pivot mounting of mower 2 in relation to main frame 1.

Viewed in relation to the direction of travel, two forward-projecting extension arms 40 and 41 are securely attached (e.g., welded) to main frame 1. The position of extension arms 40 and 41 can be seen particularly clearly in Figure 1.

It can be clearly seen, in particular from the depiction provided in Figure 6, that extension arms 40 and 41 feature tail parts 42 that extend downwards. Each tail part 42 is faced by an essentially vertically aligned strut 43, which, as can also be seen in Figure 6, is attached to mower frame 11, e.g., once again through welding. Each of tail parts 42 is connected to facing strut 43 of mower 2 by a lower parallelogram linkage 44 and an upper parallelogram linkage 45. The length of each of upper parallelogram linkages 45 can be adjusted by means of a twistable sleeve 46, thereby enabling the inclination of mower 2 to be adjusted in relation to the soil surface and thus also enabling adjustment, within certain limits, of the mower's cutting height.

In order to prevent mower 2 from dropping downwards when it is being lifted into its transport position corresponding to the depiction in Figure 7, two chains 47 are provided between extension arms 40 and 41 and mower frame 11. The end links of chains 47 are secured, in each case, to mower frame 11 by socket bolt 48 and to extension arms 40 and 41 by socket bolt 49. The coupling of mower 2 outlined above ensures that mower 2 is able to follow the unevenness of the ground while equally ensuring that it can also be transferred into a raised transport position.

In connection with the depiction according to Figure 1, mention has already been made of the fact that subframe 4, which carries wheels 9 and 10, is arranged in a pivotable manner in relation to main frame 1. Vertical, upward-pointing, fixed joint pieces 50 and 51, which are set at a slight lateral distance from each other, are located approximately at the center of subframe 4. Joint pieces 50 and 51 are connected to each other in their upper region by means of pins 52 and 53 (Figure 6).

Pin 53 passes through piston rod 54 of single-acting hydraulic cylinder 55. The front end (viewed in the direction of travel) of hydraulic cylinder 55 is mounted in bearing support 56 in a pivotable manner. Bearing support 56 is a fixed component of bearing plate 57, which is arranged beneath hydraulic cylinder 55, and which for its part, too, is attached to main frame 1.

Upon the charging of hydraulic cylinder 55, subframe 4 rotates counterclockwise. Wheels 9 and 10 follow this motion, so that main frame 1, mower 2 coupled thereto, and conditioning apparatus 3 are moved into the raised transport position given in Figure 7. The subsequent drop into the working position is carried out by means of the agricultural machine's own weight as soon as the hydraulic fluid

has been able to escape from hydraulic cylinder 55 through the connecting pipe.

The coupling of conditioning apparatus 3 in relation to main frame 1 and the possibility of also preventing this apparatus from dropping unintentionally are explained in the following sections with reference to Figures 1, 8, and 9.

Supporting arms 60 and 61 are attached to conditioning apparatus 3. The top view according to Figure 1 shows how supporting arm 60 and extension arm 40, and supporting arm 61 and extension arm 41, respectively, lie on common axes of symmetry in relation to the longitudinal direction and direction of travel, respectively, of the agricultural machine. The upper, angled, and consequently forward-projecting ends 62 of supporting arms 60 and 61 are equipped with downward-pointing, open receiving elements 63. Receiving elements 63 accommodate extension arms 40 and 41 between them, whereby upper socket pins 49, which also serve to secure the chains, pass through both receiving elements 63 and extension arms 40 and 41. For the rest, these connections are formed as disconnectable pin-and-socket arrangements, so that conditioning apparatus 3 can be disconnected relatively easily from extension arms 40 and 41.

As described above, the connection between conditioning apparatus 3 and main frame 1 is designed in a manner that enables the relative movement of conditioning apparatus 3 in relation to main frame 1. For purposes of clarification, however, it should be mentioned that conditioning apparatus 3 supports itself on main frame 1 during normal operation in a manner whereby ends 62 of supporting arms 60 and 61 lie against the top of main frame 1. A further essential feature is the fact that the mower is fully freed from the weight of the conditioning apparatus.

It is frequently the case in agricultural practice that crops have to be harvested without being simultaneously processed (conditioned). To save the farmer from having to detach the conditioning apparatus in such cases, the proposed agricultural machine provides a simple-to-operate locking device, which ensures that the conditioning apparatus remains in its raised state (i.e., in an inoperative position) while the mower is lowered to the soil surface to harvest the crop. This optional operating position is shown in Figure 9. In this position, the drive connection for the conditioning apparatus is detached.

To achieve the purpose described above, locking hook 66 is mounted in a pivotable manner on bearing pin 65 between two side pieces 64 (Figure 8). In this connection, the length of locking hook 66 is dimensioned in a manner that enables it to overlap pin 52 when the agricultural machine's main frame 1 has been raised into the position that corresponds to its transport position. This position, in which locking hook 66 overlaps pin 52, is shown in Figure 8. From this position, mower 2 can be



brought into contact with the soil surface by lowering main frame 1, whereby, as can be seen in Figure 9, conditioning apparatus 3 is prevented from dropping downwards. It is then possible to mow without simultaneously conditioning the crop. An essential feature of the proposed arrangement is that all the driving elements for mower 2 and conditioning apparatus 3 are accommodated on main frame 1, and indeed within the effective mower width. This portion of the agricultural machine, which represents a high proportion of its weight, is supported on wheels 9 and 10. Accordingly, mower 2 and conditioning apparatus 3 are freed from this proportion of weight. Furthermore, the mower and the conditioning apparatus are mounted on main frame 1 separately. This provides some crucial advantages. For one, the mower can easily follow the unevenness of the ground and, for another, the conditioning apparatus can be left on the agricultural machine even if it is not itself due to be used. Furthermore, the arrangement described has the significant

advantage that costly balancing devices for the mower and/or the conditioning apparatus can be fully dispensed with. In this context, it is also important to note that the necessary protective devices (protective hoops, fabrics, and the like) can be attached to main frame 1, as well, i.e., that even these devices do not influence the weight of the mower. Ultimately, the conditioning apparatus used, which, in the embodiment depicted, is equipped with substantially V-shaped, splayed tines, can be replaced with a conditioning apparatus of a different design at any time, e.g., a design that makes use of plastic brushes, particularly since, in these cases, it is not necessary for a separate gear system to be provided for each conditioning apparatus for the purpose of driving it at different speeds. The situation becomes even simpler if the choice is made to simply swap between a variety of rotor shafts with various designs of conditioning tools while keeping the conditioning apparatus unchanged.

Patent Claims

